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ORIGINAL ARTICLE

Clinical scale for the diagnosis of ventriculoperitoneal shunt malfunction in children in Emergency Department☆,☆☆

David Muñoz-Santanach[a,*], Victoria Trenchs Sainz de la Maza[a], Santiago Candela Canto[b], Carles Luaces Cubells[a]

[a] *Servicio de Urgencias, Hospital Sant Joan de Déu, Universitat de Barcelona, Esplugues de Llobregat, Barcelona, Spain*
[b] *Servicio de Neurocirugía, Hospital Sant Joan de Déu, Universitat de Barcelona, Esplugues de Llobregat, Barcelona, Spain*

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KEYWORDS
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Abstract
Introduction: It is well known that some symptoms in children with ventriculoperitoneal shunt are associated with a higher risk of developing shunt malfunction. However none of those symptoms are sensitive or specific enough to diagnose the shunt malfunction.
Objective: To develop a diagnostic scale to identify children with an increased risk of shunt malfunction in the Emergency Department.
Material and methods: This is a prospective study including children aged one to eighteen years old admitted to the Emergency Department between April 2010 and March 2013 with symptoms of ventriculoperitoneal shunt malfunction. Logistic regression Analysis was used to determine whether or not the variables were considered independent risk factors for shunt malfunction. The results led to the development of a diagnostic scale.
Results: A scale was developed using 9 variables (erythema, swelling or discharge from the catheter trajectory, drowsiness, stiff neck, headache, afebrile, age >4 years, vomiting, recent neurological deficit, and time since last surgery ≤2 years) with a maximum score of 20 points. It was found that Scale scores ≥7 points were associated with an increased risk of shunt malfunction (OR 34.0, 95% CI 15.4–74.9; sensitivity 88.3%, specificity 81.1%, PPV 53.4%, NPV 96.7%).
Discussion: A diagnostic scale is designed for assessing the risk of shunt malfunction, selecting those patients with a higher risk. The use of this scale could help the management of these patients, reducing complementary tests, as well as the usual radiation suffered by these children.

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* Corresponding author.
E-mail address: dmunoz@hsjdbcn.org (D. Muñoz-Santanach).

PALABRAS CLAVE
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Escala clínica para el diagnóstico de disfunción de válvula ventriculoperitoneal en niños en el Servicio de Urgencias

Resumen
Introducción: Es conocido que la presencia de determinadas manifestaciones clínicas en los niños portadores de una válvula ventrículo-peritoneal (VDVP) se asocia a un mayor riesgo de disfunción valvular (DV), sin embargo, ninguna de estas es suficientemente sensible y específica por sí sola para diferenciar los pacientes que presentan una DV de los que no, y permitir así una actuación diagnóstica y terapéutica más adecuada.
Objetivo: Elaborar una escala diagnóstica que permita seleccionar en el Servicio de Urgencias a los niños con riesgo de DV.
Material y métodos: Estudio prospectivo. Se incluyó a los pacientes portadores de VDVP con edad comprendida entre 1 y 18 años que consultaron con sintomatología potencialmente asociada a DV en un Servicio de Urgencias durante 3 años (1 de abril del 2010-31 de marzo del 2013). Mediante regresión logística se determina qué variables se consideran factores de riesgo independientes de DV; con ellos se elabora una escala diagnóstica.
Resultados: Se obtiene una escala basada en 9 variables (eritema, tumefacción o secreción en el trayecto del catéter; somnolencia; rigidez de nuca; cefalea; ausencia de fiebre; edad mayor a 4 años; vómitos; focalidad neurológica reciente y tiempo desde la última intervención quirúrgica menor o igual a 2 años) con una puntuación máxima de 20 puntos. Puntuaciones de la escala de 7 o más puntos se asocian a un mayor riesgo de DV (OR 34,0; IC del 95%, 15,4-74,9; sensibilidad 88,3%; especificidad 81,1%; VPP 53,4%; VPN 96,7%).
Discusión: La escala diagnóstica para la valoración del riesgo de DV presentada permite seleccionar los pacientes con riesgo de DV. Su uso podría ayudar a mejorar la indicación de las pruebas complementarias que reciben los niños portadores de una VDVP y disminuir la irradiación a la que son sometidos estos pacientes.

Introduction

Placement of a ventriculoperitoneal (VP) shunt is the most frequently used treatment for hydrocephalus in children. It is estimated that between 60% and 80% of patients with a VP shunt will experience shunt malfunction (SM) within 10 years of placement,[1,2] with 40% of patients experiencing it in the first year,[3–7] and the most frequent complication is obstruction of the drainage catheter.[6,8,9] Although previously published studies have demonstrated that the presence of certain clinical manifestations, such as lethargy, irritability, shunt site swelling, increase in head circumference or the presence of focal neurological signs of recent onset have been associated to increased risk of SM,[10–15] none of them in isolation suffices to differentiate patients with SM from patients without.

Patients with VP shunts attend the Emergency Department (ED) with clinical manifestations suggestive of SM fairly frequently. Their assessment is often challenging due to the nonspecific nature of the clinical manifestations and the presence of comorbidities, and often requires performing diagnostic tests to determine whether they are experiencing shunt complications, usually cranial computed tomography (CT) and a shunt series (SS).[16,17] However, these examinations are not always conclusive and there are some patients in whom surgery reveals SM despite cranial CT or SS findings being normal or not changing compared to previous tests.[18,19] On the other hand, the literature demonstrates that exposure to ionising radiation for diagnostic or therapeutic purposes can contribute to the development of malignancies,[20–23] and paediatric patients are most vulnerable to this type of radiation.[24–26] Thus, the literature on children with cerebrospinal fluid (CSF) shunts includes reports of cases of central nervous system tumours attributed to the number of cranial CT scans undergone by patients.[27]

To date, few studies have combined different signs and symptoms to establish the risk of SM. For this reason, the aim of our study was to develop a diagnostic scale that would allow the identification of children at risk of SM in the ED.

Patients and methods

We conducted the study between April 1, 2010 and March 31, 2013 in a tertiary care women's and children's hospital with 264 paediatric beds for patients aged 0–18 years. It is the referral hospital for a service area of 1 800 000 inhabitants and receives an average of 280 visits a day.

We prospectively included all visits of patients aged 1–18 years with a VP shunt to the ED of our hospital during the period under study. We excluded visits of patients with a VP shunt that were in palliative care and were not eligible for surgery on account of their underlying disease, visits of